

United States Patent Application

Title of the Invention

A METHOD OF AND AN APPARATUS FOR CONTROLLING
A WEB SERVER, A WEB SERVER CONTROL PROGRAM, AND
A STORAGE MEDIUM ON WHICH THE WEB SERVER
CONTROL PROGRAM IS STORED

Inventors

Masaru IGAWA,
Yoshihiro TAKIYASU.

09715121 112000

A METHOD OF AND AN APPARATUS FOR CONTROLLING A WEB SERVER,
A WEB SERVER CONTROL PROGRAM, AND A STORAGE
MEDIUM ON WHICH THE WEB SERVER CONTROL PROGRAM IS STORED

INS A1

BACKGROUND OF THE INVENTION

The present invention relates to a method of
controlling a WEB server, the method being applied to a
video data distributing system using retrieval functions of
5 the WEB.

Protocols utilized on the Internet are
comprehensively called World Wide Web (WWW) and servers
which transmit information by use of the WWW are called WEB
servers. Since WEB servers are operating worldwide, users
10 capable of accessing the Internet can acquire information
from such WEB servers. Information available to the users
include primarily texts, still pictures, audio data, and
video data of a low bit rate less than or equal to about
100 kilobits per second (Kb/s).

15 Additionally, there have been conducted business
activities through the Internet, for example, a system in
which each user accesses a WEB server, ^{and} selects articles or
goods to buy the selected articles on credit using his or
her credit card. An example of the system has been
20 described in page 47 of the "Nikkei Multimedia" published
from Nikkei BP (Vol. 1997. 1, No. 19).

09715121-112000

5 through the provider.

15 VOD server. In response to the request, the VOD server sends the required video data to the user. An example of the VOD server has been described in an article "Video On Demand" in pages 110 and 111 of the "Nikkei Multimedia" published from Nikkei BP (Vol. 1997. 2, No. 20).

25 Part 12 "Configuration 4 scenario characteristics" (Chapter
9.19 in pages 83 to 147) describes a stipulation which
makes it possible to access WEB servers via the Internet

B

When a user requests video data related to
5 information on a page of ^a WEB server, the video data is
distributed from the WEB server in the conventional method.
However, it is difficult to obtain in a realtime manner the
video data via the Internet at a high bit rate equal to or
more than several megabits per second (Mb/s) for the
10 following reasons. That is, it is not the first object of
the WEB servers to transmit video data. Moreover, the
network throughput is limited in the Internet. Therefore,
it is difficult to receive by the terminal device high-
quality video data related to WEB information. In
15 consequence, the transfer rate of video data is to be
lowered or the user cannot view the video data in the
realtime manner. Namely, the video data is once downloaded
on a disk of the terminal device to be reproduced at
original rate later by the terminal device.

20 In accordance with DAVIC, the access to the
Internet and that to the VOD server are completely
independent of each other and there exists no stipulation
concerning VOD server information to be kept by the WEB
servers. Consequently, there is no way to obtain video
25 data related to WEB server information from a VOD server
connected to another network.

3

3

B.

Alternatively, on receiving a request of distribution of video data from the terminal device, the WEB server transfers a client unit of ^a VOD system kept therein to the

B terminal device and ~~then~~ ^{Then} the WEB server, retrieves an address of a VOD server necessary for the terminal device to receive the distributed video data and an identifier of the video data ~~and then~~ transfers these items to the
5 terminal device.

B With this provision, when retrieving video data regarding the inspected WEB page, the terminal device receives the address identifying the VOD server and the identifier indicating the video data, and hence it is
10 possible to immediately obtain the video data from the VOD server.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and features of the present invention will become more apparent from the consideration of the
15 following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a block diagram showing a network environment in a first embodiment in accordance with the present invention;

B 20 Fig. 2 is a diagram showing ^{the} constitution of a WEB server 5000 in the first embodiment;

Fig. 3 is a PAD flowchart showing a processing procedure of a control unit for HTTP scripts 5520 in the first embodiment;

25 Fig. 4 is a diagram showing a WEB page displayed and contents of description of HTML files in the first embodiment;

09715121.112000

B.

B 5

10

15

B

Fig. 15 is a diagram showing program units loaded

B

The
g st

5

10

15

DESCRIPTION OF THE PREFERRED EMBODIMENTS

20

25

It is assumed that a manager beforehand stores in the WEB server 5000 information on VOD server addresses and a list of video data in the VOD server. The terminal

device 1000 issues a request to the WEB server 5000 for a WEB page 7001 to resultantly acquire the WEB page 7001. *Shown in Fig. 4*

When buttons for retrieving video data 7003 are associated with the WEB page 7001, the WEB server 5000 describes in an HTML file defining a WEB page a VOD server 4000 in which video data is stored and an identifier of video data in the VOD server ~~400~~⁴⁰⁰⁰ and then transfers the WEB page therefrom.

When the user selects the buttons for retrieving video data on the WEB page from the terminal device, a request for video data is transferred to the VOD server 4000 through the HTTP protocol. In accordance therewith, the VOD server

4000 distributes the video data to the terminal. The video data is expanded by the terminal device to be audio-visually enjoyed by the user. The HTTP protocol has been described in pages 588 to 602 of the "Netscape FastTrack Server" written by Robert P. Lipshutz and John Garris, Translated into Japanese by Toshihiro Takeuchi, and published from Gijutsu-Hyoro-Sha in 1997.

Assume, for example, that an application of ~~an~~ electronic shopping is running on the WEB server 5000. A user views a WEB page of the electronic shopping on a terminal device. In the WEB page, there is provided a button to display video data related to the shopping. When the user selects the button, the terminal device transmits a request for video data to the VOD server 4000 through the

Consequently, by selecting the buttons for retrieving video data 7003 displayed on the WEB page 7001, the user can issue a request for video data to the VOD server 4000 without giving special attention thereto to thereby audio-visually enjoy the video data.

Fig. 2 shows the construction of the WEB server 5000 of the present invention. The WEB server 5000 includes a display 5100, a keyboard 5200, a central processing unit (CPU) 5300, a network device 5400, a main memory 5500, a magnetic disk 5600, a bus 5700. Loaded in the main memory 5500 are an input unit of information of server 5510, a control unit for HTTP server, and an HTTP server 5530. On the magnetic disk 5600, there are stored a table 5610 of addresses of VOD server 4000, a table of identifiers of video data 5620, Hypertext Markup Language (HTML) files for lists of video data 5630, and HTML files 5640.

20 The display 5100, the keyboard 5200, the network
device 5400, the main memory 5500, and the magnetic disk
5600 are accessed by the CPU 5300 via the bus 5700. The
network device 5600 supervises communication of data with
the LAN 3000. On receiving a request issued by a user from
25 a terminal device for information through the HTTP
protocol, the HTTP server 5530 selects a necessary HTML
file from the HTML files and sends the file to the terminal
device. The input unit of information on ^{the}server is a

program having a user interface for the manager of the WEB
server 5000 to input data to the table of addresses of VOD
server addresses 5610 and the table of identifiers of video
data 5620. The control unit for HTTP server 5520 describes
5 information on addresses of the VOD server 4000 in a WEB
page. When buttons to retrieve video data exist in the WEB
page transferred from the HTTP server to the terminal
device, the control unit for HTTP server 5520 retrieves an
address of VOD server 4000 in which the video data is
10 stored and an identifier of the data from the table of
addresses of VOD servers 5610 and the table of identifiers
of video data² and then describes information on the address
and the data on the WEB page. Thereafter, the HTTP server
5530 transfers the page to the terminal device.

15 In an application of electronic shopping, the
HTTP server 5530 uses the HTML files 5640 to transfer the
WEB page 7001 for the electronic shopping to the terminal
device 1000. When there exists a page including buttons to
retrieve video data related to articles, the HTTP server
20 5530 retrieves an address of the VOD server 4000 and an
identifier of the video data, describes the address and the
identifier in an HTML file 7400, and then transfers these
items to the terminal device 1000.

As can be seen from Fig. 2, the control unit for
25 HTTP server 5520 includes an address conversion unit 5521,
a unit of searching video servers 5522, a unit of creating
HTML scripts 5524, and a buffer 5525. The control unit for
HTTP server 5520 is implemented as a CGI program or unit to

00000 "TATST/60

be activated by the HTTP server 5530 when necessary. In this embodiment, the CGI unit is used to create a new HTML file. The creating procedure has been described in pages 93 to 122 of the "A Guide to CGI" written by Eric Herrmann, translated into Japanese by Teiko Kuno and Yasushi Kuno, and published from Prentice Hall in 1997.

Subsequently, the processing procedure of the control unit for HTTP server 5520 will be described by referring to the PAD flowchart of Fig. 3. On receiving an activation request from the HTTP server 5530 (step 6002), the unit 5520 receive an IP address of the terminal device 1000 from the HTTP server 5530. First, the address conversion unit 5521 starts its operation to convert the IP address into a network address (step 6003). Since the network address is stipulated by the Internet Engineering Task Force (IETF) providing standardization of protocols on the Internet, the conversion is achieved in accordance with rules (RFC790 of IETF). The rules will be briefly described below.

Assume that an IP address of a terminal device is expressed by a 32-bit binary number. When the upper-most bit of the number is zero, the bits up to ^{the} 23rd bit of the IP address represent a network address. When the upper-most bit of the number is one, the bits up to ^{the} 15th bit of the IP address represent a network address. Moreover, when ^{the} two upper-most bits are "11", the bits up to ^{the} 7th bit thereof indicate a network address. According to this

B

5

20

B

B ~~part~~ of buttons for retrieving video data ^{part} 7003 as shown in Fig. 4. The HTML file 7004 includes, in association with the contents of the page, a ~~part of~~ description of information, ^{part 7005 and a description part} ~~7005 and a part of description~~ 7006 of a location of a page to be next referred to when the buttons for retrieving video data are selected. This is described, for example, as follows.

Thanks to this description, when the buttons for retrieving video data are selected, the HTTP server can transmit *B* to the terminal device the WEB page 7001 including the address of the VOD server 4000 and the identifier of video data.

Fig. 5 shows an example of the table of addresses of VOD servers 5610. The table 5610 is used by the unit of searching video servers 5522 to retrieve an address of ^a VOD server in accordance with a network address of a terminal device. Each record of the table 5610 includes a network address 5611 of a terminal device 1000 and an address of ^a VOD server 5612 with a correspondence established therebetween. The address of the VOD server 4000 is an address of a server which can distribute video data to a terminal device having the network address. It is assumed that the manager of the WEB server 500 beforehand stores pertinent data in the table 5610 so that the data is accessed for reference in step 6005 of the control unit for HTTP server 5520.

In the storage example of Fig. 5, a network address "102.100.0.0" corresponds to an address of VOD server 400 "server3.network3". Therefore, in step 6005 of the control unit for HTTP server 5520, it is possible to
5 read the address "server3.network3" of the VOD server 4000 to distribute video data to the terminal device having the network address "102.100.0.0".

Fig. 6 shows the table of identifiers of video data 5620, which is used by the unit of searching video
10 servers to read information on an identifier of video data in the VOD server 4000. The table 5620 includes a field for name of video data 5621. In this example, in association with video data, there are stored identifiers of video data 5622 to 5624 respectively stored in the VOD
15 servers 1 to 3. Also in this table 5620, the manager of the WEB server 5000 stores pertinent data in advance such that the data is utilized in step 6006 of the control unit for HTTP server 5520 to read an identifier of video data stored in the VOD server.

20 For example, an identifier of the name of video data "shoes_1" stored in the VOD server 4000 having the address "server1.network1" is obtained as dir1/dir2/name1. Consequently, in step 6006 of the control unit for HTTP server 5520, using the VOD server indicated by the address
25 of VOD server read from the buffer and the video data read from the buffer, the video data identifier "dir1/dir2/name1" is read from the table of identifiers of video data 5620. Additionally, a mark of "x" indicates absence of

000211 "F251260

6

5

10

15

The VOD server 4000 of Fig. 1 receives a request for distribution of video data through the HTTP protocol. As an example of the VOD server of this kind, there has

Finally, description will be given of an example of the user interface screen to input information on ^aVOD server to the WEB server 5000. Fig. 8 shows a screen image to create a table of addresses of VOD servers 5610. As already described, a network address of a terminal device can be derived from an IP address thereof. A network address of the terminal device is inputted to a field 7110² and an address of a VOD server which can be accessed from the terminal device is inputted to a field 7120. For easy understanding in the operation later, a name of the VOD server is inputted to a field 7130.

Fig. 9 shows an example of a screen image displaying a list of VOD servers inputted as above. Selecting one of the VOD servers therefrom, the user can display a screen image to input identifiers of video data, which will be described later. Fig. 9 includes a button 7220 for the scrolling of ^{the} displayed image when a large number of servers are to be displayed, and an area 7210 in which the button 7220 moves.

25 Fig. 10 shows a screen image in which a new name
of video data is inputted. When new video data is stored
in the VOD server 4000, a name of the video data is
inputted in a field 7310.

As above, using the WEB server 5000 of the present invention, the user can issue a request for video data to a VOD server capable of conducting VOD distribution immediately after selecting the buttons for retrieving video data on a WEB page displayed on the terminal device 1000. Consequently, the terminal device 1000 can obtain video data with a higher quality from the VOD server.

25 In the second embodiment, like the first
embodiment, information on addresses of VOD servers and
information on identifiers of video data are stored in the

WEB server 5000. Differing from the first embodiment in which information on identifiers of the VOD server 4000 and video data are simultaneously transmitted when the menu screen of video data is transferred from Web server 5000 to the terminal device, the information on identifiers of the VOD server 4000 and video data are transferred to the terminal 1000 when the terminal device issues a request for video data in the menu of video data in the second embodiment.

10 The embodiment is implemented in a network environment similar to that shown in Fig. 1. In the WEB server 5000, the manager beforehand stores information on addresses of VOD server 4000 and a list of video data in the VOD server 4000. The terminal device 1000 has, in addition to the WEB browser 1520, a client unit of VOD system 1530 to reproduce data of video data distributed from the VOD server 4000. When there are buttons for retrieving video data in the WEB page, the WEB server 5000 creates a file in which an address of a VOD server from which the terminal device can receive distributed video data and an identifier of the video data. When the user selects the buttons for retrieving video data in the WEB page from the terminal device 1000, the WEB server 5000 issues a request to activate the client unit of VOD system 1530 on the terminal device 1000 and transfers the file including information on VOD servers to the WEB browser 1520. In accordance with the information, the WEB browser

1520 immediately issues a request to the VOD server 4000 for video data to thereby obtain the video data.

The structure of the WEB server 5000 of this embodiment differs from that of the WEB server 5000 of the first embodiment in the main memory 5500 and the magnetic disk 5600. As can be seen from Fig. 12, in the main memory 5500a of this embodiment, the control unit for HTTP server 5520a does not include the unit of creating HTML scripts 5524 and includes a unit of creating server information 5526 in place thereof. Additionally included on the magnetic disk 5600a are files of information on servers 5650. The control unit for HTTP server 5520 is implemented, like in the first embodiment, as a CGI program or unit which is activated in response to a request from the HTTP server 5530.

Referring to Fig. 13, description will be given of the processing procedure of the control unit for HTTP server 5520a. When compared with the first embodiment, steps 6003 to 6005 are kept unchanged. In this embodiment, the unit of creating server information is activated after an address of the VOD server and an identifier of video data are obtained (step 6010). These information items are then written in the files of information on servers 5650.

In addition, a description indicated by a numeral 7007 in Fig. 14 is stored in a page to be transferred to the terminal device 1000.

<EMBED SCR=VodServerAddressFile>

where, VodServerAddressFile indicates the files of

09715121.112000

B

5

10

15

B

B

B 20

25

independently of the WEB browser 1520. When the buttons for retrieving video data 7003 of Fig. 14 are selected, the instruction to activate the helper application is transferred from the HTTP server 5530 to the WEB browser

1520 and then the WEB browser 1520 accordingly activates the client unit of VOD system 1530. Furthermore, the files of information on servers 5650 in which an address of the VOD server 4000 and identifiers of video data are written
B 5 ^{are} ~~is~~ transmitted from the WEB server 5000. When activated, the client unit 1530 reads the files of information on servers 5650 and accesses the VOD server 4000 in accordance therewith to reproduce the video data. An actual example of the procedure in which the client unit 1530 accesses the
10 VOD server 4000 to thereby reproduce the video data has been described in pages 110 to 115 of an article "Video On
B Demand" written in ~~the~~ "Nikkei Multimedia" published from Nikkei BP (Vol. 1997. 2, No. 20, 1997)..

As described above, when the user selects the
15 buttons for retrieving video data 7003 on the WEB page 7001 displayed on the terminal device 1000 in this embodiment, it is also possible to immediately issue a request for
B video data to a VOD server capable of distribut^{ing}~~ing~~ the video data. Therefore, the terminal device can obtain video data
20 with a higher quality from the VOD server 4000.

B Next, description will be given ^{of} ~~a~~ third embodiment in accordance with the present invention.

In the third embodiment, as in the second embodiment, information on addresses of VOD servers and
25 information of identifiers of video data are stored in the WEB server 5000. In the second embodiment, when the terminal device 1000 requests video data selected from the menu of video data, the information on identifications of

0971541.11000
000277" 7257260

the VOD server and video data are transferred thereto. In the third embodiment, unlike the second embodiment, when the terminal device 1000 requests video data selected from the menu of video data, a client unit of VOD system 5670 to reproduce video data from the VOD server 4000 is simultaneously sent to the terminal device in addition to the information on identifications of the VOD server and video data.

This embodiment is used in a network environment which is almost the same as that of Fig. 1. In the WEB server 5000, the manager beforehand stores information on addresses of the VOD servers 4000 and a list of video data in the VOD servers 4000. Moreover, a client unit of VOD system 5670 to be activated on the terminal device 1000 is beforehand created in virtual machine (VM) codes to be stored in the WEB server 5000. The WEB page 7001 includes buttons for retrieving video data 7003, ^{and} the WEB server 5000 creates a file in which an address of a VOD server from which the terminal device 1000 can receive distributed video data and an identifier of the video data are described. When the user of the terminal device 1000 selects the buttons 7003 on the WEB page 7001, the WEB server 5000 downloads the client unit 5670 of VM codes onto the terminal device 1000 and then transfers ^s information on VOD servers thereto. The terminal device 1000 reads the client unit 5670 in the main memory 1500b and activates the unit 5670. Using the information on VOD servers

The construction of the WEB server 5000 of the embodiment varies from that of the first embodiment in the main memory 5500 and the magnetic disk 5600. As shown in Fig. 16, the main memory 5500b of this embodiment does not include the unit of creating HTML scripts 5524 and includes in place thereof a unit of creating HTML scripts for downloading VM codes 5527. Additionally included on the magnetic disk 5600b are files of HTML scripts for downloading VM codes 5660 and the client unit of VOD system 5670.

The processing procedure of the control unit for HTTP server 5520b will be described by referring to Fig. 17. This unit 5520b is also implemented by a CGI unit or program as in the first embodiment. On receiving a request for display of the WEB page 7001 including buttons for retrieving video data 7003, the HTTP server 5530 initiates an instruction to activate the CGI unit. The control unit for HTTP server 5520b carries out an activating operation in accordance with the CGI activating instruction (step 6002) and then obtains an IP address of the terminal device as in the first embodiment to obtain an address of the VOD server in accordance with the IP address. The control unit 5520b then stores the name of video data and an address of the VOD server in the buffer 5525 (steps 6003 to 6005). Thereafter, in step 6012, the control unit 5520b activates the unit of creating HTML scripts for downloading VM codes.

B

5

15

25

B:

5 unit of VOD system.

```
20 be downloaded onto the terminal device..
```

25 disposed an area 7008 corresponding to the buttons for

5 for downloading VM codes 5640.

B

```
<PARAM NAME="VodServerAddress" VALUE="10001">
```

The first line is an instruction to download and activate

B

25

The memory 1500b of the terminal device varies from that of the second embodiment in that there is added a virtual machine 1540 as shown in Fig. 19. The user first

issues by the WEB browser 1520 a request for display of the
WEB page 7001 to the WEB server 5000. In response thereto,
the WEB server 5000 sends the HTML files for lists of video
data 5630. Receiving the HTML files, the WEB browser 1520
5 displays the WEB page 7001. When the WEB page 7001
includes buttons for retrieving video data 7003 and the
user selects the buttons, the WEB server 500 transfers a
client unit of VOD system 5670 described in VM codes
thereto. The client unit 5670 is activated on the virtual
10 machine 1540. At the same time, the WEB server 5000
transfers to the terminal device 1000 an address of the VOD
server 4000 keeping video data therein and an identifier of
the video data. In the terminal device 1000, the client
unit 5670 in VM codes can immediately request video data
15 necessary for the VOD server 4000 in accordance with
information on addresses of VOD servers.

In this embodiment as described above, when the
buttons for retrieving video data are selected on the WEB
page 7001 displayed on the terminal device 1000, a request
20 for video data can be immediately issued to the VOD server
4000 capable of distributing video data. Therefore, the
terminal device can obtain video data with a higher quality
from the VOD server 4000.

In accordance with the present invention, the
25 user who is accessing the WEB server can immediately issue
a request for highly precise video data associated with
information obtained from the WEB server to a video server

00000 "T25T260



Figure 1 consists of 12 bar charts, labeled (a) through (l), arranged in a 6x2 grid. Each chart displays the percentage of total protein for a specific protein in two fractions: Cytosol and Nucleus. The y-axis for all charts is 'Percent of total protein' with a scale from 0 to 100. The x-axis for all charts is 'Fraction' with two categories: 'Cytosol' and 'Nucleus'. The proteins are: (a) Cytosolic protein, (b) Nuclear protein, (c) Cytosolic protein, (d) Nuclear protein, (e) Cytosolic protein, (f) Nuclear protein, (g) Cytosolic protein, (h) Nuclear protein, (i) Cytosolic protein, (j) Nuclear protein, (k) Cytosolic protein, (l) Nuclear protein. The data shows varying distributions of these proteins between the cytosol and nucleus.